

DETERMINANT REORDERING

THE PROBLEM

- Compute nuclear two-point function
- Wave functions with hundreds to thousands terms
- A few tens of quarks of two (or three) flavors (18 us and ds for ^{12}C)
- Each pair of source and sink terms contribute a product of determinants into the two-point function

COMPLEXITY

- Lattice is sparsified in space
- A determinant can be computed in $O(N^3)$ time
- Many determinants differ by a few rows - a potential speedup
- Can reorder determinants to minimize costs

APPROACH

- Rearrange computation order offline

APPROACH I: CLUSTERING

- Group terms according to how close determinant structure is
- Select the leading term
- Compute the leading determinant and remember partial transforms
- Apply remembered transforms to each term in the group to compute the determinant

APPROACHE II: TSP

- Consider the set of determinants as a modified TSP
- Each directed edge (A,B) is assigned a cost of computing B after A
- Find an optimal traversal offline

COMPUTATION

- Large number of propagators is required - memory footprint is high
- Divide and conquer
- Use GPU (?)